ABSTRACT

A method of diagnosing pathologic heart conditions in which a time series of heart sounds is filtered and parsed into a sequence of individual heart cycles. A systolic interval as well as systolic sub-intervals are identified for each heart cycle. The systolic intervals and ECG peaks are then digitally filtered to optimize for click detection. For each heartcycle, systole time limits are determined, a time series of the transform at specific wavelet scales are input to a Neyman-Pearson "constant false alarm rate" (CFAR) detector to identify anomalously high wavelet coefficients, and a vector of detections vs. time is created. The series of anomalously high detections (one series for each heart cycle) are then assembled into a matrix and convolved with an averaging vector yielding detection statistics across heart cycles and time intervals consistent with an observed spread of click occurrence times. A click score is then determined as the maximum element of the vector formed by the median wavelet coefficient amplitude across heart cycles squared at each time sample multiplied element-wise by the vector formed by the sum across heart cycles of the number of detections at each time sample. The click score is compared to a threshold value set by a desired probability of detection vs. a probability of false alarm tradeoff. If the click score is less than the threshold then a "no click" indicator is displayed. If the click score is greater than the threshold then a "click present" indicator is displayed.